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COMBAT AIRMEN:

EXAMINING USAF EXPEDITIONARY SKILLS TRAINING

by

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Biography

Lieutenant Colonel Brandon Casey is assigned to the Air War College, Air University, Maxwell Air Force Base, Alabama. Lieutenant Colonel Casey entered the Air Force in 1997 as a graduate of the Boston University ROTC program. He is a command pilot with over 4,000 hours in the C-17A and T-1A with multiple deployments in support of Operations ENDURING FREEDOM and IRAQI FREEDOM. Lieutenant Colonel Casey is a graduate of the USAF Weapons School and a distinguished graduate of the Advanced Study of Air Mobility. He earned a Bachelor's degree in Computer Engineering and Master's degrees in Information Systems Management and Logistics. In addition to flying assignments, he served at the LeMay Center for Doctrine and Education and Headquarters, Air University. Lieutenant Colonel Casey served as Commander of the 421st Combat Training Squadron, USAF Expeditionary Center, Joint Base McGuire-Dix Lakehurst, New Jersey where he led Combat Airmen Skills Training, Security Forces Area and Base Support Operations courses, Phoenix RAVEN qualification training, the Contingency Response Formal Training Unit, and Exercise EAGLE FLAG.

Abstract

Recent conflicts have placed Airmen forward in combat, transiting and operating at higher risk than under previous Cold War models. Yet the Air Force has not sufficiently altered institutional behavior through resourcing and allocation of training time to provide Airmen with internalized combat skills or an expeditionary identity to mitigate associated increases in risk. Although Air Force pre-deployment training programs have evolved substantially throughout the past 15 years of war, all improvements were restricted by assumptions of a near-zero baseline of combat skills and training time limited by deployment sequences. These assumptions are valid in response to an imminent deployment but should not remain paramount to long-term decisions of force development. This paper explores the evolution and current state of Air Force Expeditionary Skills Training (EST), discusses barriers to changing EST, reviews existing research on training methodologies and learning retention, analyzes the Air Force combat skillset using existing retention and delivery methodology models, and provides recommendations for a future force development construct based on tested learning principles. Research results show that only 5 percent of current Air Force expeditionary skills are suitable to Computer Based Training, the delivery method used for General Purpose Force recurrent EST. Results also indicate that Airmen are unlikely to reproduce 84 percent of skills under combat conditions, even with current hands-on Advanced Deployment Readiness training. The United States Air Force needs to augment its current cognitive Expeditionary Skills Training program with semiannual hands-on training to provide Airmen with the psychomotor skills and affective internalized combat culture to mitigate the risks associated with recent and future combat environments.

Introduction

Superior specialty training has long been a source of pride for the Air Force, yet the Air Force has not allocated sufficient time and resources to cross-functional training to universally provide Airmen with the physical skills and mental preparedness to mitigate the risks associated with changing expeditionary and combat environments. In recognition of the Air Force's changing contributions to warfare, senior leadership champions an updated Air Force identity as Combat Airmen valuing and possessing a Warrior Ethos.[1] By 2004, General Jumper classified all Airmen as "Expeditionary Airmen".[2] Leadership's continued concern to instill an increased combat culture is apparent in the outbreak of new cultural visions including Air Force-wide references to "Combat Airmen", career field references such as "Combat Medics," and a universal Airmen's Creed focused on Warrior Ethos. However, the Air Force has not sufficiently altered institutional behavior through resourcing and allocation of training time to provide Airmen with internalized combat skills or an expeditionary identity.

Unlike soldiers who conduct recurring combat skills training to uphold the ethos "every soldier a rifleman," the majority of Airmen train exclusively to career field specific skills until selected for combat deployment. The Soldier's Manual of Common Tasks (SMCT) provides Army commanders with guidance about cross-functional skills training that applies to all soldiers regardless of their specialty. Conversely, Air Force leadership provides general purpose force (GPF) Airmen with limited knowledge about combat through recurring Computer Based Training (CBT), trusting just-in-time training to develop expeditionary skills employment capability. Although Air Force pre-deployment training programs have evolved substantially throughout the past 15 years of war, all improvements were restricted by assumptions of a near-zero baseline of Airmen combat skills and training time limited by pending Required Delivery

Dates (RDD). These assumptions are valid for imminent deployments but are not appropriate for long-term force development.

Interwar years provide the opportunity to reset these restrictions and to match force development to new cultural performance expectations. This paper will show that just-in-time hands-on training does not support psychomotor skill retention and performance under combat conditions over typical six month deployment intervals. Furthermore, the lack of allocated time, resourcing, and leadership backing for combat skills training prevents affective internalization of a universal Warrior Ethos. Because the preponderance of Airmen will continue to risk combat operations by basing forward in future operations, the Air Force needs to invest in recurring hands-on Expeditionary Skills Training (EST) to achieve deployment-spanning retention of critical combat tasks and a supporting internalized combat culture. This paper explores the evolution and current state of Air Force EST, discusses barriers to changing EST, reviews existing research on training methodologies and learning retention, analyzes the Air Force combat skillset using existing retention and delivery methodology models, and provides recommendations for a future force development construct based on tested learning principles.

Thesis

This research paper combines qualitative and quantitative approaches to demonstrate that the United States Air Force needs to invest time and resources towards semiannual hands-on Expeditionary Skills Training to provide Airmen with the psychomotor skills and affective internalized combat culture to mitigate the risks associated with recent and future combat environments.

Effective Expeditionary Skills Training

Increases in risk to GPF Airmen created the need for expanded EST. Cold War concepts of operation placed GPF Airmen in more secure bases removed from frontline combat. Increasingly, expeditionary and irregular modern combat has changed that construct. Airmen today routinely go forward on the battlefield, transiting and operating "outside the wire." Doctrine and sound risk management principles decree that Airmen should possess skills to respond to the hostilities presented by this changed operational environment. To mitigate risks, Airmen must be ready to perform combat skills with fluency, "accurately, quickly, and without hesitation."[3] AFDD 1-1 acknowledges Airmen must "continuously hone their skills to support the employment of military capabilities."[4] While Air Force leadership has evolved EST since September 11th, 2001, a host of constraints and restrictions disrupt the transfer of doctrinal principles into sufficient capability.

Evolution of USAF EST

At the beginning of the Global War on Terror, GPF Airmen received fragmented or ad-hoc training to perform in combat environments.[5] Airmen did receive weapons qualification, self-aid/buddy care (SABC), and chemical, biological, radiological, and nuclear training (CBRN) during mobilization. However, SABC and CBRN programs relied heavily on CBT to accommodate growing requirements, a delivery method suitable to provide basic knowledge but not hands-on experience. Weapons qualification training, while primarily hands-on, focused on basic equipment actuation as opposed to practicing employment in combat conditions. The lack of sufficient readiness to apply skills under combat conditions led to a rapid evolution of predeployment training programs.

In 2007, the Air Force established the 602 Training Group (Provisional) at Keesler Air Force Base to oversee Air Force participation in Army Combat Skills Training (CST). Airmen scheduled to embed with Army units received 45 days of Army CST to meet CENTCOM theater entry requirements. This CST was foundational training for Airmen but designed as top-off training for Army brethren who maintained basic readiness as a unit in accordance with the SMCT. Meanwhile, multiple MAJCOMs simultaneously developed varied and non-standardized CST programs to prepare Airmen serving forward but not embedded with Army.[6]

The Air Force progressed towards standardized expeditionary training by identifying Air Education and Training Command (AETC) as lead MAJCOM for CST in 2008. By 2009, the various MAJCOM programs consolidated into a common curriculum titled Combat Airmen Skills Training (CAST). AETC standardized CAST course material designed by multiple organizations including the USAF Expeditionary Center (USAFEC), Air Force Global Strike Command (AFGSC), and AETC.[7] In 2014, pursuing budget efficiency in light of troop drawdowns in Iraq and Afghanistan, AETC consolidated CAST into a single location administered by the 421st Combat Training Squadron under the USAFEC. In 2015, the Air Force CENTCOM-centric CAST syllabus updated to a generic theater expeditionary skillset. The new theater-neutral program groups all Expeditionary Skills Training (EST) into two tracks developed during an Instructional System Design conference led by AETC, hosted by the USAFEC, and attended by functional community experts and CENTCOM. Those deploying with Individual Protective Equipment (IPE) and armed with a weapon attend Fieldcraft Hostile (FC-H) while those without IPE and a weapon attend Fieldcraft Uncertain (FC-U).[8] The two tracks were a compromise of desired skills and a two-week time limit drawn from experience of mobilization timeline constraints.[9]

On 1 October 2015, AETC released a new Expeditionary Readiness Program to streamline and reduce redundancy in EST to include extending the interval between recurring training.[10] The Air Force reduced recurring training to 4 CBTs under Basic Airman Readiness (BAR): Counter-Improved Explosive Device (C-IED) awareness, CBRN, Law of Armed Conflict (LOAC), and SABC. Airmen complete CBTs once every three years for a total of six hours education, three hours with successful scores on newly implemented pre-tests. Airmen identified for deployment will complete just-in-time Basic Deployment Readiness (BDR) training at home station. BDR includes additional CBTs: SERE, Collect and Report, General Cultural, Mental Health, and a C-IED Video if requested by theater. Airmen will also complete home station hands-on Active Shooter, SABC, and Combat Arms weapons qualification and CBRN if requested by theater. As with the previous evolution, Advanced Deployment Readiness (ADR) consists of a two week hands on combat skills course if requested by theater line remarks. Meanwhile, Army personnel to include support specialties continue to conduct recurring hands-on annual EST under the SMCT to fluently react in the same environment.

Public Affairs Guidance (PAG) accompanying the new EST program lists efficiency, respect for Airmen's Time, and the CSAF policy to reduce ancillary training by 42 percent as motivations for AETC's revised program. The PAG cites lessons learned and feedback from deployed Airmen as the rationale for extending training intervals.[11] While removing duplication and implementing pre-tests for knowledgeable Airmen is certainly laudable, the motivation and decision to reduce training frequency is worthy of concern. The association of EST with ancillary training is inconsistent with AFDD 1-1 guidance to hone military skills and undermines CSAF visions for a "Combat" or "Expeditionary" Airman identity. Furthermore, existing research shows subjects' self-assessments are poorly correlated to actual capability to perform

psychomotor skills.[12] Given that combat skills inherently carry life-or-death consequences and underlie a Combat Airman identity, EST should prioritize as essential common core rather than ancillary training. Likewise, delivery methodologies and frequency should derive from empirical evidence of learning and retention rather than self-assessments.[13] Although Air Force EST has evolved and advanced greatly since September 11th, 2001, Air Force leadership has inhibited combat force development based on a multitude of constraints and restrictions.

Barriers to Changing EST

Air Force commanders face resource and cultural barriers to adequately prepare Airmen to perform career-field specific skills as they would under combat conditions. EST requires additional resources that represent growth in a constricting budgetary environment. In order to provide Airmen with hands-on EST, units need routine access to combat gear including battle armor and weapons to instill equipment muscle memory. Live fire weapons training would require additional ammunition and ranges. Practicing additional combat skills requires specialized equipment such as combatives mats, safety equipment, and expendable training aids. Regular total-force training would also require manpower increases for Combat Arms Training and Maintenance (CATM) to safely operate ranges and repair weapons. The Air Force would need local combat skills instructors, dedicated or additional duty, to train the force. Likely, the greatest resource barrier to additional training is time. Senior leadership concerns for "Airmen's Time" have grown out of a real disparity between requirements and available man-hours. It is reasonable to project that the Air Force strain from total force and career field specific requirements approximates the Army, where a 2002 Army War College study uncovered a deluge of 297 days of mandatory training requirements per year.[14] Based on 30 days of leave and 5 workdays each week, commanders have 239 workdays to accomplish training and garrison

duty requirements. There is measurably too much to do already so Air Force leadership must deliberately prioritize and allocate time for force development.

Cultural barriers could prove harder than resource barriers for commanders to overcome. Airmen identify almost exclusively with their career field and the identity within most career fields presently excludes combat skills. Post basic training Airmen have accurately assessed that, in a time and resource constrained environment, their commanders do not prioritize or reward combat skills. Colloquial inclusion of the word combat in front of a specialty (Combat Medics) or universal title (Combat Airmen) is insufficient to overcome ingrained combat-free cultures. Combat skills are so removed from community identities that it is common at all levels to group EST into "ancillary" training.[15] Even if they desired to do so, Commanders lack the resources and time to change this at the unit level. They require support from an Air Force level EST program derived from empirical evidence of learning and retention similar to the Army's SMCT.

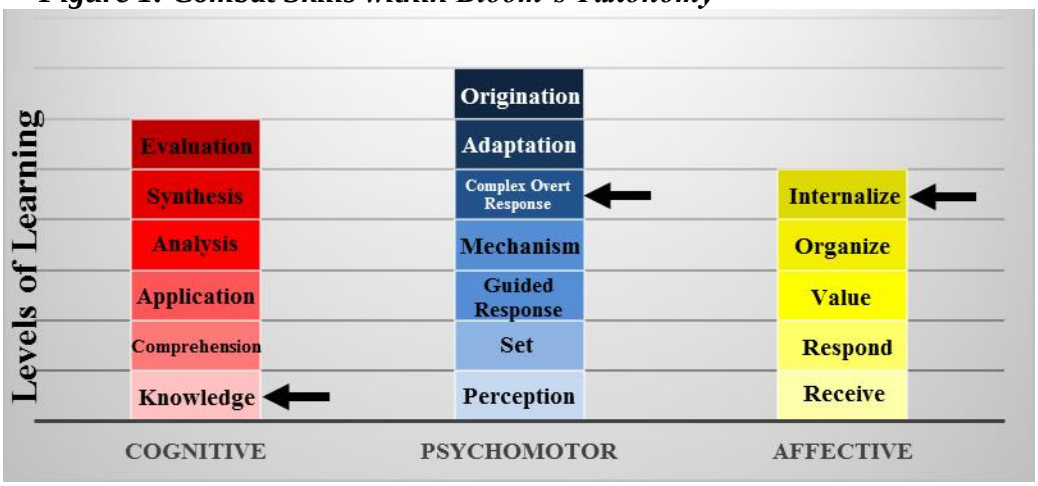
Delivery Methodology Theory

To effectively instruct combat skills, the Air Force must categorize the type of learning desired and match the delivery method, volume of practice, and frequency of exposure to generate automatic skill response throughout the duration of deployment. The majority of formal learning that Airmen experience before entering the Air Force, as well as much of the career-field specific learning during their career, is education as opposed to training. Education is the acquisition of cognitive knowledge to support problem solving and decision making to address unknown future problems. In contrast, training involves learning and automatically reproducing specific responses to known or anticipated problems. Learning combat skills involves some

preliminary cognitive knowledge education, but primarily consists of practicing automatic physical or psychomotor training.

A highly accepted framework for describing different types of learning is Bloom's Taxonomy depicted in Figure 1. Bloom's Taxonomy, initially developed in 1956, breaks learning into three domains: cognitive or thinking, psychomotor or physical, and affective or motivational. Each domain possesses corresponding levels of learning which require increasing commitments of time and resourcing. The cognitive levels, generally associated with education, are knowledge, comprehension, application, analysis, synthesis and evaluation.[16] The psychomotor levels, generally associated with training, are perception, set, guided response, mechanism or basic proficiency, complex overt response or expert, adaptation, and origination.[17] The affective levels, characterizing climate or motivation, are receive, respond, value, organize, internalize.[18] Affective learning, while not usually an objective unto itself, plays a decisive role in learning retention.[19] Most combat skills leverage basic supporting knowledge to perform a complex overt response internalized in a core Combat Airmen culture.

Figure 1: Combat Skills within Bloom's Taxonomy

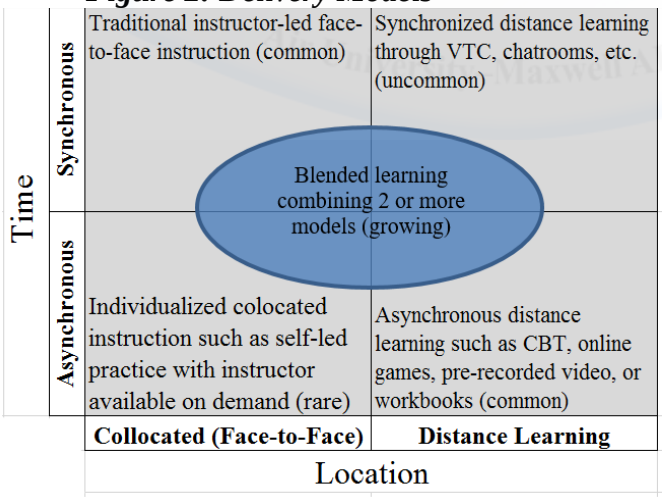


Note: Arrows indicate typical learning levels for combat skills based on assessed task characteristics

Instructional programs can choose from a variety of delivery models which provide unequal suitability to achieve different levels of learning among domains (see Figure 2). In the

dimension of time, instructors can deliver some lessons asynchronously allowing learners to absorb material at any time with the advantage of customizing the speed of learning based on their personal aptitude and prior experience.[20] Alternatively, instructors can deliver lessons synchronously to increase instructor-student interaction with the advantages of immediate feedback, instructor expert assessment, and instructor-metered material based on assessments. In the dimension of location, distance learning offers reduced cost per student and potentially greater total throughput based on transportation, lodging, classrooms, and associated expenses.[21] Conversely, face-to-face training allows for hands-on instruction, improved assessment, and access to specialized training resources. Instructors have recently blended learning options to maximize benefits, typically combining asynchronous distance learning to provide a breadth of baseline knowledge with synchronous face-to-face instruction to achieve higher cognitive or psychomotor levels of learning.

Figure 2: Delivery Models



Training can also be delivered through a variety of mediums, including written instruction, video instruction, computer instruction, face-to-face lecture, games and simulations, and hands-on practice.[22] With creativity, instructors can develop additional and hybrid mediums. Progressing along the above list of mediums increases costs of instructor and student time as

well as resourcing, but also facilitates learning complexity associated with higher levels of learning. For example, a civilian study demonstrated computer based training suitability to instruct declarative knowledge, but provided insufficient instructor interaction to facilitate associative instruction.[23] To maximize the efficiency of learning, instructors should desire for objectivity of delivery methodology decisions based on rational criteria over inherent status quo preference.[24] Pairing learning methodology theory with learning retention theory offers the potential to develop a capable force.

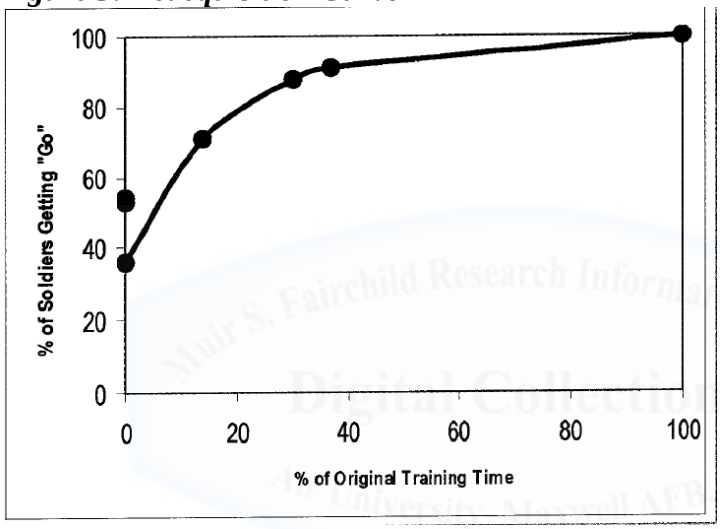
Learning Retention Theory

Directly examining Air Force EST methodologies requires foundational knowledge of the root problem: learning skills and not forgetting them over a time interval, in this case the duration of a deployment. While more is always better when it comes to training, realities of resource and time constraints necessitate that leadership efficiently manage training requirements to maximize overall capabilities. Therefore, the goal is to design a training program that will prepare Airmen to apply expeditionary skills fluently under combat conditions for deployment durations while minimizing expenditure of time and resources. Academic research provides knowledge about how people learn, how fast and why they forget, and how training programs can be optimized to retain skills for maximum duration.

Positive transfer of training is defined as the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in training to the job. For learning to have occurred, learning behavior must be generalized to the job context and maintained over a period of time.[25] Learning is not linear; the benefit of additional training diminishes over time and flattens once an individual can reproduce the desired skill. Additional practice helps to increase automaticity, "the ability to perform skills without conscious attention."[26] Automaticity is necessary for

combat skills that must be performed as rapidly as possible and likely under surprise for support personnel not initiating combat. Relearning is also easier than learning as shown by Figure 3. Retraining time to achieve original performance, known as the reacquisition curve, is consistently less than half the original training time."[27] If Airmen need to prepare for combat skills on short notice, it is desirable that they previously have learned skills to the necessary level in order to minimize training time required during mobilization.

Figure 3: Reacquisition Curve [28]



Note: Previously learned skills can be reacquired in less than half the original time

Students can execute skills at the learned level for a predictable retention interval before the skills decay and they forget. Studies show that forgetting is a function of amount learned and the passage of time.[29] Skill decay eventually renders trained and untrained groups indistinguishable.[30] A meta-study by the U.S. Army Research Institute demonstrated that the rate of decay varies based upon skill type as depicted in Figure 4. Decision skills or cognitive tasks experience moderate decay. Study participants lost only 20 percent of their cognitive knowledge for up to a year. Job knowledge decays based upon performance expectations. Learners successfully demonstrated recognition of information by choosing among alternatives (multiple choice or true/false) at 86 percent reliability for up to 26 weeks. However researchers

found that recall of information, reproducing information without presented alternatives, dropped performance to 53 percent proficiency at 26 weeks.[31] Finally, retention of execution skills varied by skill properties. Perceptual motor skills such as bike riding or marksmanship experienced low decay for up to two years while procedural skills such as first aid, rifle malfunctions/function checks, and chemical/biological response, experienced 50 percent or greater loss as early as six months.[32] Although pre-deployment training includes decision, job knowledge, and execution skills, the majority of training focuses on procedural execution subject to 50 percent or greater skill decay after six months.

Researchers found significant variation in recall of procedural skills attributable to four task factors: complexity, demand, memory aids, and stress. Soldiers retained tasks with complexity between five and nine steps well, decreasing to zero retention by 15 steps. Tasks with only one correct sequence generated worse retention than those with interchangeable steps while tasks with built-in feedback improved performance. Tasks that demand recall of more than 4-8 memorized facts decay rapidly as do tasks that overload participants with processing large amounts of data. Of note, tasks requiring moderate fine motor skills such as typing retain longer than those requiring high or low fine motor skills.[33] Job and memory aids, including checklists, labels, and mnemonic devices greatly aid skill retention. Conversely, performance decreases greatly with stress from task time limits, combat, or other safety considerations.[34]

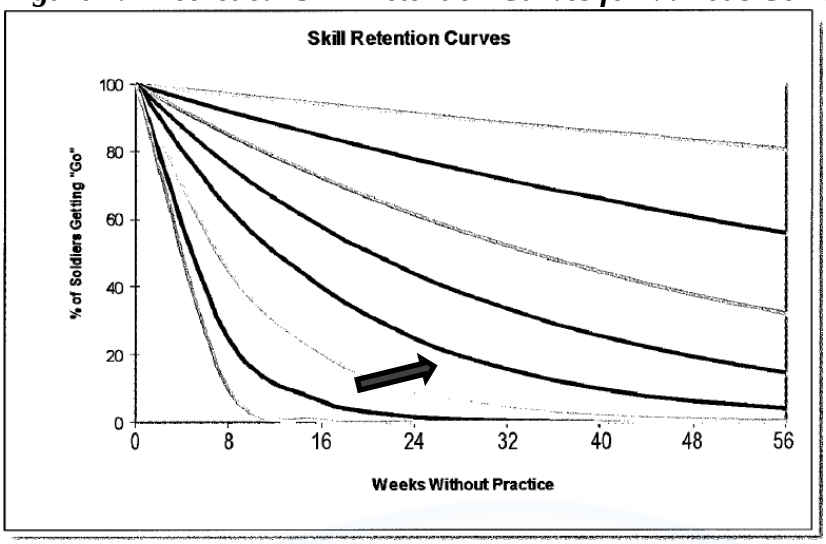
Retention also varies based upon learner-related factors including prior knowledge, aptitude, and motivation.[35] Trainee characteristics of prior knowledge and aptitude, while significant, are outside the scope of this paper as constants at the time of pre-deployment training. However, research suggests that controllable environmental factors including leadership and organizational climate affect motivation, learning, and retention.[36] Motivation to

use a skill stems from confidence in ability and beliefs in skill applicability to the job.[37] Learners will underperform if they do not feel learning is important to them and will discard skills that they do not believe will improve their ability to conduct the mission more effectively.[38] If co-workers support skill development as important to job execution and supervisors value skills in assessments and rewards, learners will develop and retain skills better. Supervisors can enable skill practice and co-worker support can enable valuable peer tutoring.[39] Conversely, task overload, crisis environments, and a lack of acceptance by co-workers inhibit practice and promote skill decay and forgetting.[40] Combat skills must be valued by Leadership and peer communities to promote skill development, internalization, and performance when required in combat.

To preserve skill performance over time requires relapse prevention based upon the amount, frequency, and design of training. Additional training in the form of practice increases skill resiliency. Research demonstrates that overlearning, the concept of practicing a skill beyond 100 percent accuracy, can make skills highly resistant to decay.[41] The additional repetitions beyond the initial demonstration of success strengthens associations, creating muscle memory that improves both short and long term retention and resulting in improved automaticity.[42] Equally valuable as the amount of training is training frequency through spacing or interval training.[43] Material learned under distributed practice is retained longer than material learned all at once.[44] Experiments show that those who learned in two sessions, sleeping between them, as well as those with prior experience learned better.[45] Finally, the design of training programs plays a crucial role in relapse prevention. Trainers can prolong skill retention by introducing testing in formats similar to desired execution and including job and memory aids for later reference.[46] Additionally, research demonstrates that purposely providing students with

overt awareness of degradation, strategies for retention, and remotivation during a two week military training course led to greater use and retention of skills.[47]

Figure 4: Theoretical Skill Retention Curves for Various Combat Tasks [48]



Note: Arrow represents "flattening" of curve with relapse prevention techniques such as overlearning

The empirical understanding of learning, forgetting, and retention provides a foundation for analyzing and adjusting EST to support infrequent but reliable automatic execution in combat. Readers looking for a more in-depth understanding of military skill retention and forgetting should refer to the extensive literature review by Bryant and Angel (2000).[49] Over the past few decades, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has conducted a series of studies aimed at developing deliberate criteria for matching education and training requirements with appropriate delivery methods, mediums, and frequencies. Evaluating Air Force EST through ARI processes offers to mitigate combat risks given pervasive constraints on time and resources.

Research Methodology and Results

ARI developed the Predicting Military Task Retention program in 1985 to enable military trainers to ensure adequate task proficiency while accounting for declining performance caused by forgetting.[50] Its authors designed it as an easy to use method for predicting how rapidly

individual tasks are forgotten to assist military units deciding what to retrain and when to give refresher training. Although 30 years have passed since its initial release, the model continues to be recognized in current papers as the best available quantitative method for predicting proficiency.[51] Although the ARI is continuing research with intent to publish an updated model in the future, ARI researchers assess the 1985 model to be reasonably accurate and useful for prediction at this time.[52]

The Predicting Military Task Retention Model draws on the learning and forgetting principles discussed above to characterize task difficulty using a series of 10 questions (Table 1).[53]

Table 1: ARI Military Task Retention Model

1	Are job or memory aids intended to be used (such as S-A-L-U-T-E or manual)?
2	Quality scale of job/memory aid to complete task without additional knowledge
3	Number of steps required to do the task
4	Are the steps required to be performed in a definite sequence?
5	Does the task have built-in logic to provide feedback if you are doing it correctly?
6	Does the task have a time limit for completion?
7	What are the mental or thinking requirements (complexity)?
8	How many facts, terms, names, rules, or ideas must a soldier memorize to do the task?
9	How difficult are the facts, terms, names, rules, or ideas to remember?
10	What are the motor skill demands of the task (hammering a nail to repairing a microchip)?

Scores for the 10 questions are tallied by task to form a total difficulty score. Performance prediction tables convert scores to estimated retention intervals. Appendix 1 assesses 56 skills derived from the syllabi and lesson objectives of ADR, BDR, and BAR phases of Air Force pre-deployment training, evaluating them with the Task Retention Model to provide an overall difficulty score. The table includes estimated percentage of personnel likely to retain the skill after six months and denotes if a Quick Reference Card is available in the Airman's Manual. The current Army training interval for comparable skills in the SMCT is also included for comparison.[54]

The Task Retention Model indicates that for 84 percent of USAF EST pre-deployment tasks (47 of 56) the majority of Airmen are unlikely to retain the skill by six months into deployment. The nine successful skills scored high on questions 5 and 6, inherently logical tasks without significant performance time constraints. The results are consistent with learning and retention principles which indicate that automaticity required to perform a skill under critical time constraint of combat requires regular practice. Information suitable to long retention intervals can be characterized as non-time critical, broken into two to ten steps with built in logical feedback, and aided by detailed job aids such as the Airman's Manual Quick Reference Cards which overcome requirements to memorize and recall specific facts, nomenclature, codes, or doctrinal concepts. Unfortunately, most critical combat tasks do not match this description. EST lesson designers should be aware of and design courses with the learning and forgetting principles captured in the Military Task Retention Model, constructing tasks in a manner to maximize reproducibility. However, combat skill retention requires automaticity established through practice and overlearning to build psychomotor muscle memory and flatten forgetting curves.

If tasks must be delivered frequently to large numbers of individuals, it becomes essential to pursue delivery methods that minimize cost, time, and resources consistent with skill acquisition and practice. The Air Force currently limits BAR recurring EST to asynchronous CBT delivery to reduce costs, maximize throughput, and enable flexibility. However, CBT is more suitable to cognitive than psychomotor skill development and asynchronous training is less effective at achieving higher levels of psychomotor learning on Bloom's Taxonomy. ARI researchers developed an additional decision process in 2009 to evaluate lesson suitability for transition to distributed or blended learning delivery methodologies using the criteria listed in

Table 2.[55] ARI used descriptive statistical analysis to classify more than two thousand lessons into 3 categories: full transfer (FT), partial/blended transfer (PBT), or no transfer (NT).

Table 2: ARI Delivery Methodology Decision Process

1	Remove lesson if specialized tech, weapons systems, or field environment required
2	Remove lesson if face-to-face interaction required
3	Determine if lesson requires observation/evaluation by an instructor/expert
4	Remove lesson if observation/evaluation cannot be mitigated by communication tech
5	Determine if lesson focuses on conceptual skills and/or abstract knowledge

Appendix 2 applies the five-step Delivery Methodology process to the 56 Air Force predeployment tasks. Combat skills are primarily psychomotor tasks and therefore benefit from hands-on experience with actual equipment to build muscle memory and familiarity with built-in equipment feedback. Combat skills, primarily classified as complex overt psychomotor responses, require face-to-face instructor observation and feedback. The results of Appendix 2 are consistent with the 2009 Army study which determined that 99 percent of Full Transition courses fell in a Reflecting on Concepts cognitive lesson grouping.[56] Only 5 percent of Air Force EST evaluated suitable to exclusively CBT delivery. [57] While the Army study found that most "practicing procedure" lessons would benefit from blended learning to reinforce associated cognitive concepts, fully transitioned courses lacked the psychomotor fidelity to prepare soldiers to execute warrior skills in an operational environment. [58] Full transition also risked undermining the affective "social processes necessary for Soldiers to come to see themselves as Soldiers."[59] Similarly, if recurring EST is limited to CBT for Airmen, they will not develop the necessary psychomotor benefits of training and will not come to affectively internalize a warrior identity.

Recommendations

Air Force EST should consist of regular hands-on training managed at the unit level similar to the Army's mostly semi-annual program in SMCT but reduced in scope to the 56 skills in the current Air Force program. A two week Advanced Deployment Readiness course should continue to provide Airmen with just-in-time realistic and immersive top-off training similar to Army mobilization training, but cannot replace the need for regular periodic training. This change would acknowledge that although Airmen deploy to provide specialized tasks by career field, they still require a set of common warrior skills inherent to Combat Airmen.

Managing this program at the unit level similar to the Army's SMCT is consistent with the Air Force focus on Commander's Inspection Programs aided with Management Internal Control Toolset (MICT) checklists of expectations established by higher headquarters. Unit commanders ultimately are responsible for ensuring Airmen are ready to fulfill a Designated Operational Capability in a deployed environment. But commanders cannot tackle this shortfall alone. The Air Force must provide solutions to the resource and cultural barriers unit commanders face to implementing recurring EST. Commanders would require program guidance, unit and base instructor training, expeditionary training equipment, training ranges, and expanded CATM personnel. AETC should match the CBT suite to all 56 skills with annual frequency to enable efficient blended learning when paired with a Commander's hands-on training program.

Acknowledging shrinking budgets and prevalent problems with Airmen's time, the Air Force cannot simply add this as an unresourced additional program. Implementation of an Air Force-wide program in the absence of surplus time and resources requires Air Force level prioritization to mandate participation and allocate manpower and resources. While challenging,

this is not insurmountable. High profile ancillary training programs have earned similar institutional prioritization and resourcing to include manpower and mandated time allocation. Managing combat risks to Airmen in a manner consistent with available evidence of learning and retention is a command responsibility and worth this level of effort and prioritization. Ultimately garrison expectations and manpower calculations should adjust to reflect a deliberately derived operations-to-training ratio, but that plan needs to include critical common core alongside career field skills training.

Conclusion

Because today's Airmen need to operate on and between bases located inside the combat zone, they require expeditionary skills and an internalized Warrior Ethos to mitigate combat risks similar to Army support personnel who do not seek out but may encounter combat. Previously Air Force leadership recognized a combat skills shortfall for Airmen deploying to Iraq and Afghanistan, adding just-in-time training to develop combat skills and espousing a Warrior Ethos to try to establish affective internalization of values. This was the best that could be done given present realities of near-zero training baselines and an immediate need to deploy Airmen. But given the life-or-death importance of common core combat skill, the Air Force should leverage existing research to develop long-term training programs that allow Airmen to learn and retain combat skills and internalize an identity as Combat Airmen.

Airmen are unlikely to reproduce 84 percent of combat skills instructed during predeployment training in a combat situation by six months into deployment according to ARI research. Furthermore, while CBT can provide Airmen with cognitive knowledge, programs must blend in hands-on courses to effectively develop psychomotor capabilities. The Air Force's October 2015 reduction in EST frequency drew on unreliable readiness self-assessments likely

biased by an underdeveloped combat culture. It also incorrectly associated essential common core combat skills as ancillary training. Research supports that Airmen need recurrent EST delivered through blended-learning to generate automatic overt responses, flatten their forgetting curves, and internalize a Warrior Ethos.

It is unreasonable to expect Airmen to possess psychomotor combat skills or affectively internalize a Warrior Ethos without an investment in time, resources, and a demonstrated leadership vision of and commitment to developing Combat Airmen. All Combat Airmen need to be ready to survive and employ their craft in combat. Leadership at all levels should not overlook this responsibility.

Appendix 1: Task Retention Evaluation

	Task Name	Q1: Job/ Mem Aid	Q2: Aid Quality	Q3: Number of Steps Coefficient	Q4: Sequence	Q5: Logical	Q6: Time	Q7: Mental Reqt	Q8: Number of Facts Coefficient	Q9: Hard to Remember	Q10: Motor Control Reqt	Total Score	% Retain at 6 months	Army SMCT	AFTTP 3-4 Quick Ref
Military Task Retention Evaluation - Air Force Predeployment Training															
ADVANCED DEPLOYMENT READINESS (CAST or FC -H/U)															
Foundation															
1	Escalation of Force / Positive Identification	1	2	14	5	22	0	28	18	34	0	**124**	**9**	**AN**	Yes
2	Active Shooter / Insider Threat	1	2	14	5	22	0	28	18	34	0	**124**	**9**		Yes
Weapons Sustainment															
3	Weapons Sustainment: Clearing	1	2	14	5	19	0	37	20	34	0	**132**	**16**	**SA**	Yes
4	Weapons Sustainment: Loading	0	0	14	5	19	40	37	18	31	0	**164**	**61**	**SA**	Yes
5	Weapons Sustainment: Firing	0	0	14	5	22	0	3	18	34	16	**112**	**2**	**SA**	Yes
6	Weapons Sustainment: Reloading	0	0	14	5	22	0	28	20	34	0	**123**	**9**	**SA**	Yes
7	Weapons Sustainment: Unloading	1	2	14	5	19	40	37	20	34	0	**172**	**72**	**SA**	Yes
8	Weapons Sustainment: Maintenance/Cleaning	0	0	0	0	11	40	28	13	31	0	**123**	**9**	**QT/AN**	No,in 3-4
9	Weapons Sustainment: Immediate Action	1	2	12	0	19	0	28	18	31	0	**111**	**2**	**QT**	Yes
Tactics															
10	Tactical Movement: React to Contact	1	1	12	0	19	0	28	18	31	0	**110**	**2**	**SA**	Yes
11	Tactical Movement: React to Indirect Fire	1	1	14	0	19	0	28	18	31	0	**112**	**2**	**SA**	Yes
12	Tactical Movement: React to Ambush	1	1	0	0	19	0	28	18	31	0	**98**	**0**	**SA**	Yes
13	Tactical Movement: React to Sniper	1	1	14	0	19	0	28	18	31	0	**112**	**2**	**SA**	Yes
14	Tactical Movement: Break Contact	1	1	12	0	19	0	28	18	31	0	**110**	**2**	**SA**	Yes
Land Navigation															
15	Land Nav: Map Reading	1	1	12	0	11	35	3	13	12	2	**90**	**0**	**AN**	Yes
16	Land Nav: Compass	0	0	12	5	11	35	28	18	31	0	**140**	**21**	**AN**	No
17	Land Nav: DAGR	1	2	0	5	22	35	28	18	12	0	**123**	**9**	**AN**	No
18	Land Nav: Point to Point/Pace Count	1	2	14	5	22	35	37	20	34	2	**172**	**72**	**SA**	No
Communication															
19	Basic Comm: Use of Radios	0	0	12	5	19	35	28	18	12	0	**129**	**12**	**SA**	No
20	Basic Comm: Prowords, Phonetics, Brevity	0	0	25	10	22	35	37	0	31	2	**162**	**61**	**AN**	No
Counter IED															
21	Counter-IED: Recognition	1	1	25	10	22	0	0	13	12	2	**86**	**0**	**AN**	No
22	Counter-IED: Reaction Dismounted	1	2	14	5	19	35	3	18	31	2	**130**	**12**	**AN**	Yes
23	Counter-IED: Reaction Mounted	1	2	14	5	19	35	3	18	31	2	**130**	**12**	**AN**	No
24	Counter-IED: 9-Line	1	25	12	5	22	35	28	18	31	2	**179**	**85**	**AN**	Yes
Tactical Combat Casualty Care (TCCC)															
25	Tactical Combat Casualty Care - Tourniquet	1	25	12	5	19	0	3	18	31	0	**114**	**4**	**AN**	Yes
26	TCCC - Bleeding	1	25	14	5	19	0	3	18	31	0	**116**	**4**	**AN**	Yes
27	TCCC- Airway	1	25	12	5	19	0	3	18	31	0	**114**	**4**	**AN**	Yes
28	TCCC - Nasopharyngeal Airway	1	25	12	5	19	0	3	18	31	0	**114**	**4**	**AN**	Yes
29	TCCC - Sucking Chest Wound	1	25	12	5	19	0	3	18	31	0	**114**	**4**	**AN**	Yes
30	TCCC - Shock	1	25	14	5	19	0	3	18	31	0	**116**	**4**	**AN**	Yes
31	TCCC - Head/Neck/Spinal	1	25	12	5	19	0	3	18	31	0	**114**	**4**	**AN**	Yes
32	TCCC - Abdominal	1	25	14	5	19	0	3	18	31	0	**116**	**4**	**AN**	Yes
33	TCCC - Eye	1	25	14	5	19	0	3	18	31	0	**116**	**4**	**AN**	Yes
34	TCCC - Sprains/Fractures	1	25	12	5	19	0	3	18	31	0	**114**	**4**	**AN**	Yes
35	TCCC- Burns	1	25	14	5	19	0	3	18	31	0	**116**	**4**	**AN**	Yes
36	TCCC - 9 Line	1	25	12	5	22	35	28	18	31	2	**179**	**85**	**AN**	Yes

Combatives / Self Protection															
37	Self Protection - Grappling	0	0	14	5	19	0	28	18	12	3	**99**	**0**	**SA**	No
38	Self Protection - Strikes	0	0	14	5	19	0	28	18	12	3	**99**	**0**	**SA**	No
39	Self Protection - Break contact	0	0	14	5	19	0	28	18	31	3	**118**	**4**	**SA**	No
40	Self Protection - Weapons Takeaways	1	1	12	5	19	0	28	18	31	3	**118**	**4**	**SA**	No
Mounted Operations															
41	Mounted Operations - React to Contact	0	0	12	0	19	0	28	18	31	0	**108**	**2**		No
42	Mounted Operations - Vehicle Crossload	0	0	12	0	19	0	28	18	31	0	**108**	**2**		No
43	Vehicle Egress - Vehicle Rollover	1	2	0	5	19	0	28	18	31	0	**104**	**1**		Yes
Urban Operations															
44	Urban Operations - Urban Movement	0	0	14	0	19	0	28	13	31	0	**105**	**1**	**SA**	No
45	Urban Operations - Building Defense and Retrograde	0	0	14	0	19	0	28	13	31	0	**105**	**1**	**AN**	No
	BASIC DEPLOYMENT READINESS (BDR)														
	Local Active Shooter	Tasks evaluated under ADR Active Shooter													
	Local SABC Hands On	Tasks evaluated under ADR T-CCC													
	Local Combat Arms	Tasks evaluated under ADR Weapons Sustainment													
Chemical Biological Radiological Nuclear (CBRN)															
46	CBRN - Identify	1	2	14	0	11	35	28	0	12	2	**105**	**1**	**AN**	Yes
47	CBRN - Employ mask	1	25	12	5	22	0	37	20	34	16	**172**	**72**	**SA**	No
48	CBRN - Employ GCE/JLIST	1	25	12	5	22	0	37	20	34	0	**156**	**42**	**SA**	No
49	CBRN - Employ M8/M9	1	25	14	5	19	35	28	18	31	0	**176**	**85**	**AN**	No
50	CBRN - Decontamination	1	25	14	5	19	35	28	18	31	0	**176**	**85**	**AN**	Yes
51	CBRN - Attack/Recovery	1	2	14	0	11	35	0	0	12	2	**77**	**0**	**AN**	Yes
Survival Evasion Resistance and Escape (SERE)															
52	Survival	1	1	0	0	11	35	3	0	12	0	**63**	**0**		No
53	Evasion	0	0	0	0	11	0	3	0	12	0	**26**	**0**		No
54	Resistance in Captivity	0	0	0	0	11	35	3	0	12	0	**61**	**0**		No
55	Escape	0	0	0	0	11	35	3	0	12	0	**61**	**0**		No
56	Personnel Recovery	0	0	0	0	19	35	28	0	0	0	**82**	**0**		No
	BASIC AIRMAN READINESS (BAR)														
	C-IED	Tasks evaluated under ADR C-IED													
	LOAC	Tasks evaluated under ADR Escalation of Force													
	SABC	Tasks evaluated under ADR T-CCC													
	CBRN	Tasks evaluated under BDR CBRN													

Appendix 2: Methodology Evaluation

Delivery Metholdogy Evaluation					
	Task Name	**Distance Learning Transition**	**Training Activity**	**(A)Synchronous**	**Comparative Army Course**
ADVANCED DEPLOYMENT READINESS (CAST or FC -H/U)					
Foundation					
1	Escalation of Force / Positive Identification	Yes	Conceptual	Asynchronous	BCT/TSIRT
2	Active Shooter / Insider Threat	No	Social	N/A	N/A
Weapons Sustainment					
3	Weapons Sustainment: Clearing	Blended/Partial	Procedural	Asynchronous	BCT/TSIRT
4	Weapons Sustainment: Loading	No	Procedural	N/A	BCT/TSIRT
5	Weapons Sustainment: Firing	No	Procedural	N/A	BCT/TSIRT
6	Weapons Sustainment: Reloading	No	Procedural	N/A	BCT/TSIRT
7	Weapons Sustainment: Unloading	No	Procedural	N/A	BCT/TSIRT
8	Weapons Sustainment: Maintenance/Cleaning	No	Procedural	Asynchronous	BCT/TSIRT
9	Weapons Sustainment: Immediate Action	No	Procedural	N/A	BCT/TSIRT
Tactics					
10	Tactical Movement: React to Contact	No	Procedural	N/A	BCT
11	Tactical Movement: React to Indirect Fire	No	Procedural	N/A	BCT
12	Tactical Movement: React to Ambush	No	Procedural	N/A	BCT
13	Tactical Movement: React to Sniper	No	Procedural	N/A	BCT
14	Tactical Movement: Break Contact	No	Procedural	N/A	BCT
Land Navigation					
15	Land Nav: Map Reading	Blended/Partial	Procedural	Asynchronous	BCT
16	Land Nav: Compass	Blended/Partial	Procedural	Asynchronous	BCT
17	Land Nav: DAGR	Blended/Partial	Procedural	Asynchronous	BCT
18	Count	Blended/Partial	Procedural	Asynchronous	BCT
Communication					
19	Basic Comm: Use of Radios	Blended/Partial	Procedural	Asynchronous	BCT
20	Phonetics, Brevity	Blended/Partial	Procedural	Asynchronous	BCT
Counter IED					
21	Counter-IED: Recognition	Blended/Partial	Procedural	Asynchronous	TSIRT
22	Dismounted	Blended/Partial	Procedural	Asynchronous	TSIRT
23	Counter-IED: Reaction Mounted	Blended/Partial	Procedural	Asynchronous	TSIRT
24	Counter-IED: 9-Line	Yes	Conceptual	Asynchronous	TSIRT
Tactical Combat Casualty Care (TCCC)					
25	Tactical Combat Casualty Care - Tourniquet	Blended/Partial	Procedural	Asynchronous	BCT
26	TCCC - Bleeding	Blended/Partial	Procedural	Asynchronous	BCT
27	TCCC- Airway	Blended/Partial	Procedural	Asynchronous	BCT
28	TCCC - Nasopharyngeal Airway	Blended/Partial	Procedural	Asynchronous	BCT
29	TCCC - Sucking Chest Wound	Blended/Partial	Procedural	Asynchronous	BCT
30	TCCC - Shock	Blended/Partial	Procedural	Asynchronous	BCT
31	TCCC - Head/Neck/Spinal	Blended/Partial	Procedural	Asynchronous	BCT
32	TCCC - Abdominal	Blended/Partial	Procedural	Asynchronous	BCT
33	TCCC - Eye	Blended/Partial	Procedural	Asynchronous	BCT
34	TCCC - Sprains/Fractures	Blended/Partial	Procedural	Asynchronous	BCT
35	TCCC- Burns	Blended/Partial	Procedural	Asynchronous	BCT
36	TCCC - 9 Line	Yes	Conceptual	Asynchronous	TSIRT

Combatives / Self Protection					
37	Self Protection - Grappling	No	Social	N/A	BCT
38	Self Protection - Strikes	No	Social	N/A	BCT
39	Self Protection - Break contact	No	Social	N/A	BCT
40	Takeaways	No	Social	N/A	N/A
Mounted Operations					
41	Mounted Operations - React to Contact	Blended/Partial	Procedural	Asynchronous	BCT
42	Mounted Operations - Vehicle Crossload	Blended/Partial	Procedural	Asynchronous	BCT
43	Vehicle Egress - Vehicle Rollover	Blended/Partial	Procedural	Asynchronous	BCT
Urban Operations					
44	Urban Operations - Urban Movement	No	Procedural	N/A	BCT
45	Urban Operations - Building Defense and Retrograde	No	Procedural	N/A	BCT
	BASIC DEPLOYMENT READINESS (BDR)				
	Local Active Shooter	Tasks evaluated under ADR Active Shooter			
	Local SABC Hands On	Tasks evaluated under ADR T-CCC			
	Local Combat Arms	Tasks evaluated under ADR Weapons Sustainment			
Chemical Biological Radiological Nuclear (CBRN)					
46	CBRN - Identify	Blended/Partial	Procedural	Asynchronous	BCT
47	CBRN - Employ mask	Blended/Partial	Procedural	Asynchronous	BCT
48	CBRN - Employ GCE/JLIST	Blended/Partial	Procedural	Asynchronous	BCT
49	CBRN - Employ M8/M9	Blended/Partial	Procedural	Asynchronous	BCT
50	CBRN - Decontamination	Blended/Partial	Procedural	Asynchronous	BCT
51	CBRN - Attack/Recovery	Blended/Partial	Procedural	Asynchronous	BCT
Survival Evasion Resistance and Escape (SERE)*					
52	Survival	Blended/Partial	Procedural	Asynchronous	TSIRT
53	Evasion	Blended/Partial	Procedural	Asynchronous	TSIRT
54	Resistance in Captivity	Blended/Partial	Procedural	Asynchronous	TSIRT
55	Escape	Blended/Partial	Procedural	Asynchronous	TSIRT
56	Personnel Recovery	Blended/Partial	Procedural	Asynchronous	TSIRT
	BASIC AIRMAN READINESS (BAR)				
	C-IED	Tasks evaluated under ADR C-IED			
	LOAC	Tasks evaluated under ADR Escalation of Force			
	SABC	Tasks evaluated under ADR T-CCC			
	CBRN	Tasks evaluated under BDR CBRN			

* Note: SERE skills reevaluated from original study assessment based on consult with original study author. Original ARI study assessed CBT suitability tautologically based upon lesson plan terminology which described a CBT methodology requirement within course objectives [56]

Notes

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[41] Dougherty and Johnston, "Overlearning, Fluency, and Automaticity," 289.

[42] Bryant and Angel, "Retention and Fading," 27.

[43] Ibid., 22.

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